

MULTIMEDIA



UNIVERSITY

STUDENT ID NO

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MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 3, 2016/2017

PEM0026 – TRIGONOMETRY AND GEOMETRY

(All Sections/Groups)

1 JUNE 2017

9.00 a.m. – 11.00 a.m.

(2 Hours)

INSTRUCTIONS TO STUDENT

1. This question paper consists of 6 pages including the cover page.
2. Attempt **ALL FOUR** questions. All questions carry equal marks and the distribution of marks for each question is given.
3. Please write all your answers in the answer booklet provided. All necessary working **MUST** be shown.
4. Only **NON-PROGRAMMABLE** calculator is allowed.

APPENDIX**TRIGONOMETRY IDENTITIES**

$$\sin^2 \theta + \cos^2 \theta = 1 \quad ; \quad \sec^2 \theta = 1 + \tan^2 \theta \quad ; \quad \csc^2 \theta = 1 + \cot^2 \theta$$

$$\sin 2\theta = 2 \sin \theta \cos \theta$$

$$\cos 2\theta = \cos^2 \theta - \sin^2 \theta = 2 \cos^2 \theta - 1 = 1 - 2 \sin^2 \theta$$

$$\tan 2\theta = \frac{2 \tan \theta}{1 - \tan^2 \theta}$$

$$\sin(A \pm B) = \sin A \cos B \pm \cos A \sin B$$

$$\cos(A \pm B) = \cos A \cos B \mp \sin A \sin B$$

$$\tan(A \pm B) = \frac{\tan A \pm \tan B}{1 \mp \tan A \tan B}$$

$$2 \sin A \cos B = \sin(A + B) + \sin(A - B)$$

$$2 \cos A \cos B = \cos(A + B) + \cos(A - B)$$

$$2 \sin A \sin B = \cos(A - B) - \cos(A + B)$$

$$\sin A + \sin B = 2 \sin \frac{A+B}{2} \cos \frac{A-B}{2} \quad ; \quad \sin A - \sin B = 2 \cos \frac{A+B}{2} \sin \frac{A-B}{2}$$

$$\cos A + \cos B = 2 \cos \frac{A+B}{2} \cos \frac{A-B}{2} \quad ; \quad \cos A - \cos B = -2 \sin \frac{A+B}{2} \sin \frac{A-B}{2}$$

$$\sin^2 \frac{A}{2} = \frac{1 - \cos A}{2} \quad ; \quad \cos^2 \frac{A}{2} = \frac{1 + \cos A}{2} \quad ; \quad \tan^2 \frac{A}{2} = \frac{1 - \cos A}{1 + \cos A}$$

$$\sin \frac{A}{2} = \pm \sqrt{\frac{1 - \cos A}{2}} \quad ; \quad \cos \frac{A}{2} = \pm \sqrt{\frac{1 + \cos A}{2}} \quad ; \quad \tan \frac{A}{2} = \pm \sqrt{\frac{1 - \cos A}{1 + \cos A}} = \frac{1 - \cos A}{\sin A} = \frac{\sin A}{1 + \cos A}$$

Continued...

QUESTION 1 (25 MARKS)

- (a) Given that $\sin \theta = \frac{a-8}{a}$, $\cos \theta = \frac{12}{a}$ and θ lies in the first quadrant. Find the constant a .

[6 marks]

- (b) Given that $\cos \theta = -\frac{4}{5}$ and $\tan \theta > 0$, find the remaining 5 trigonometric functions.

[5 marks]

- (c) Given function $f(x) = 5 \sin(4x - \pi) + 2$,

- i. find the amplitude, period, and phase shift of the function $f(x)$.

[5 marks]

- ii. sketch the graph of $f(x)$ in the interval of $0 \leq x \leq 2\pi$.

[5 marks]

- (d) If $\tan \theta = 2$, show that

$$\frac{2 \sin \theta + \cos \theta}{\sin \theta - \cos \theta} = 5$$

[4 marks]

Continued...

QUESTION 2 (25 MARKS)

- (a) Prove the following identity

$$-4 \sin^3 \theta + 3 \sin \theta = \sin(3\theta)$$

[6 marks]

- (b) Write the expression for $\sin(\sec^{-1} u)$ as an algebraic expression in terms of u , where $u > 0$.

[4 marks]

- (c) Solve the following equation on the interval $0 \leq \theta \leq 2\pi$.

$$2 \sin^2 \theta - 2 \sin \theta \cos \theta = 1$$

[8 marks]

- (d) Given that $a = \sin \theta$ and $b = \cos^2(2\theta) + \cos^2 \theta$.
Express b in term of a by eliminating θ with the use of trigonometry identities.

[7 marks]

Continued...

QUESTION 3 (25 MARKS)

(a) Given an equation of $r = 6\sin\theta$

- i. Transform the equation to rectangular form. Determine whether the equation represents a circle.

[6 marks]

- ii. Graph the equation in rectangular grid

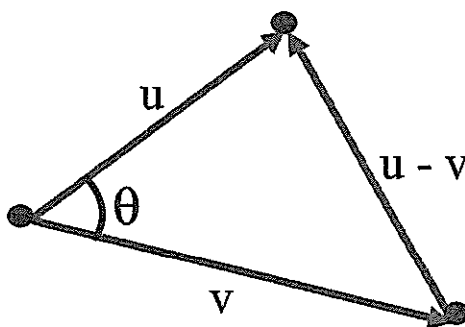
[2 marks]

(b) Find the complex cube roots of $2 + i$. Leave your answer in polar form with the argument in degrees ($0 \leq \theta < 360^\circ$).

[4 marks]

(c) Based on the following diagram, show how the law of cosines can be used to find the angle in between the two vectors u and v .

[5 marks]



(d) Given two vectors $a = -2i + 3j + 6k$ and $b = 5i - 4j + 7k$. Find their

- i. Dot product

[4 marks]

- ii. Cross product

[4 marks]

Continued...

QUESTION 4 (25 MARKS)

(a) Given point $A (0,2)$. Find the equation and sketch the graph of a line passing the point A if

i. the slope $m = 0$

[2 marks]

ii. the slope $m = -2$

[2 marks]

(b) Write the equation of the lines that parallel to the graph $2y - x = 4$ and containing the point $(-4, 4)$.

[6 marks]

(c) Find the vertex, the focus, the directrix and the length of the latus rectum of the parabola $x = -\frac{1}{4}(y + 5)^2 + 3$.

[12 marks]

(d) Check if the graph $x^2 + (y - 2)^2 = 4$ is symmetric with respect to

i. x-axis

[1 mark]

ii. y-axis

[1 mark]

iii. the origin

[1 mark]

End of Paper